WESTON®

INSTRUCTIONS • PARTS LIST

# MODEL 1234

## DIGITAL PANEL METER

# INSTRUCTIONS/PARTS LIST

# FOR

# MODEL 1234

# DIGITAL PANEL METER

U.S. Patents 3,051,939; 3,316,547
and other Patents Pending

Copyright 1975

**WESTON INSTRUMENTS,**
**a Division of Sangamo Weston, Inc.**
614 FRELINGHUYSEN AVENUE, NEWARK, N.J. 07114

SANGAMO WESTON
Schlumberger

F-3834R4
6/77

Printed in U.S.A.

## INTRODUCTION

The Weston Model 1234 Digital Panel meter is a compact single range, 4-1/2 digit, bi-polar, high impedance instrument designed to indicate input DC voltage or current in one of 10 possible ranges. The non-blinking digital display has a full scale count of 19999. When an input above 19999 counts is applied, the display will show only the 10,000's "1" digit, the decimal in use, and the "-" symbol if a negative signal is applied. The basic measuring circuit is a high impedance bi-polar analog to digital converter which employs dual-slope integration.

Additional features are: Remote Hold, to stop A/D conversions and hold current BCD and display data at current values; polarity BCD bit; over-range BCD bit; external selection of decimal position. Four decades of 1-2-4-8 BCD TTL (Binary Coded Decimal Transistor-Transistor Logic) and the numeric 10000 can be provided as optional features.

The case front has a circularly polarized filter window to eliminate glare. External electrical adjustments are made accessible by removing the front assembly.

Figure 1 shows the pictorial view and overall dimensions.

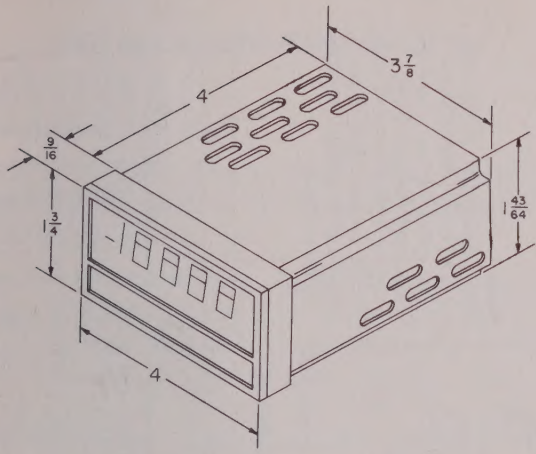



**Figure 1. Outline Dimensional Drawing**

## SPECIFICATIONS

| | |
|---|---|
| Minimum Range | ±00.00 to 200.00mVDC |
| Outrange Indication | Except on 1000V range |
| Rated Accuracy | Short Term ±0.01% Rdg. ±0.025 F.S. (ref. conditions, 24 hrs.) |
| | Long Term ±0.03% Rdg. ±0.02% F.S. |
| Linearity | ±0.01% Rdg. ±0.015% F.S. |
| Input Impedance | ⩾5 Megohms (Ref Table 1) |
| Temperature Coefficient | 50 ppm R ±0.2 digits/° C (1V, 100V, & 1000V ranges) |
| | 50 ppm R ±0.3 digits/° C (all other ranges) |
| Sensitivity | 10 microvolts |
| CMRR | 80dB with 1000 ohm unbalance at 60Hz |
| NMRR | 40dB at 60Hz |
| Reading Rate | 7.5 readings/second (15, 30 optional) |
| Response Time | ⩽2 seconds (F.S. step) |
| Power | 117V nominal (105V to 129V) 50Hz to 60Hz 6 Watts (also available for 100, 220, or 240 volt line.) |
| Weight | Approx. 2 pounds |
| Operating Temperature | 0° C to 50° C |
| Storage Temperature | -40° C to 70° C |

Refer to Table 1 for specifications pertaining to specific ranges.

**Notes:** 1. TTL BCD outputs optional.
2. Specifications subject to change without notice.

**TABLE 1. TABLE OF SPECIFICATIONS**

| RANGE | INPUT IMPEDANCE | FULL SCALE PRESENTATION | OVERLOAD MAX. VOLTAGE |
|---|---|---|---|
| 200mV | 10MΩ | 199.99 | 60V |
| 2V | 100MΩ | 1.9999 | 60V |
| 20V | 5MΩ | 19.999 | 1000V |
| 200V | 5MΩ | 199.99 | 1000V |
| 1000V | 5MΩ | 1000.0 | 1100V |
| 20μA | 10k Ω | 19.999 | — |
| 200μA | 1k Ω | 199.99 | — |
| 2mA | 100Ω | 1.9999 | — |
| 20mA | 10Ω | 19.999 | — |
| 200mA | 1Ω | 199.99 | — |

**Notes:**

Max. presentation 19999 on all ranges except 1000V range.

Max. voltage between common input terminal pin 10 and earth gnd pin R 500VAC RMS or DC except 1000V range.

Specifications subject to change without notice.

**TABLE 2. CATALOG NUMBERS**

| RANGE | CATALOG NUMBERS (1234-XXXXXX) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 117VAC | 117VAC w/BCD | 100VAC | 100VAC w/BCD | 220VAC | 220VAC w/BCD | 240VAC | 240VAC w/BCD |
| 200mV | 276493 | 276513 | 276563 | 276573 | 277322 | 277342 | 277332 | 277352 |
| 2V | 276494 | 276514 | 276564 | 276574 | 277323 | 277343 | 277333 | 277353 |
| 20V | 276495 | 276515 | 276565 | 276575 | 277324 | 277344 | 277334 | 277354 |
| 200V | 276496 | 276516 | 276566 | 276576 | 277325 | 277345 | 277335 | 277355 |
| 1000V | 276497 | 276517 | 276567 | 276577 | 277326 | 277346 | 277336 | 277356 |
| 20μA | 276498 | 276518 | 276568 | 276578 | 277327 | 277347 | 277337 | 277357 |
| 200μA | 276499 | 276519 | 276569 | 276579 | 277328 | 277348 | 277338 | 277358 |
| 2mA | 276500 | 276520 | 276570 | 276580 | 277329 | 277349 | 277339 | 277359 |
| 20mA | 276501 | 276521 | 276571 | 276581 | 277330 | 277350 | 277340 | 277360 |
| 200mA | 276502 | 276522 | 276572 | 276582 | 277331 | 277351 | 277341 | 277361 |

## Panel Mounting

1. Unpack the meter and perform a visual inspection to assure that no damage has occurred during shipment or handling.
2. Remove front assembly. Rotate the four mounting screws (located in the four inner corners) 3 or 4 times counterclockwise to position the mounting cams correctly. Mount the main assembly (see Figure 2) on a panel 1/16 to 1/8 inch thick. The panel shall be prepared in accordance with the panel cutout dimensions as shown in Figure 3. Rotate the four mounting screws clockwise to position the mounting cams in the lock position and secure the instrument to the panel.

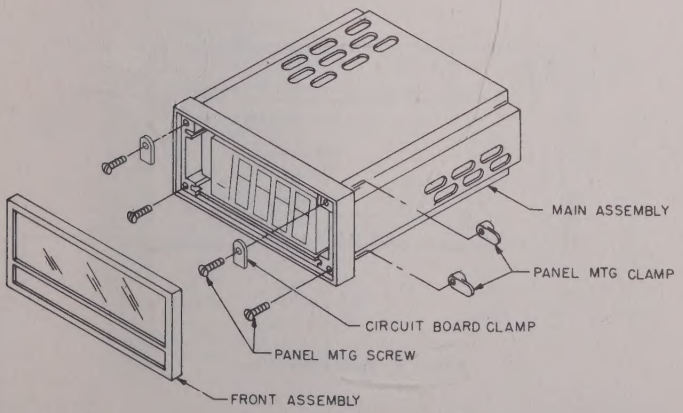



**Figure 2. Meter Mounting Drawing**

3. The front assembly can be secured into position at this time. The front assembly will have to be removed to adjust and calibrate the meter.

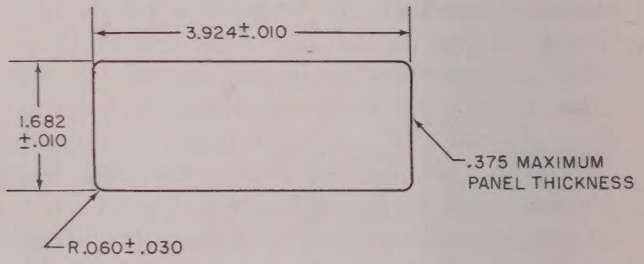



**Figure 3. Panel Cut-Out Dimensions**

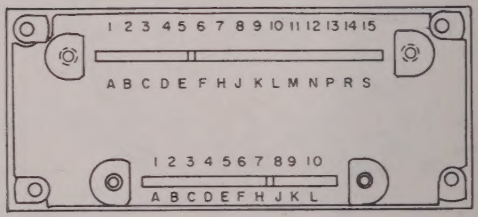



**Figure 4. Rear Case View**

## INSTALLATION–ELECTRICAL

The Digital Panel meter has provisions to accept two connectors at the rear of the case. They are available as an accessory package: Upper connector (Analog) under Catalog Number 9790-0267253, ELCO No. 00-6007-030-980-002 and lower connector (Digital) under Catalog Number 9760-0277371. The connectors are provided with two screws No. 4-40 thd x 1/2 inch long binding head Part Number ND39956-024.

For operation without optional BCD information, the upper connector (Analog) only is required. The lower connector (Digital) is used in conjunction with the upper connector when the BCD option is desired.

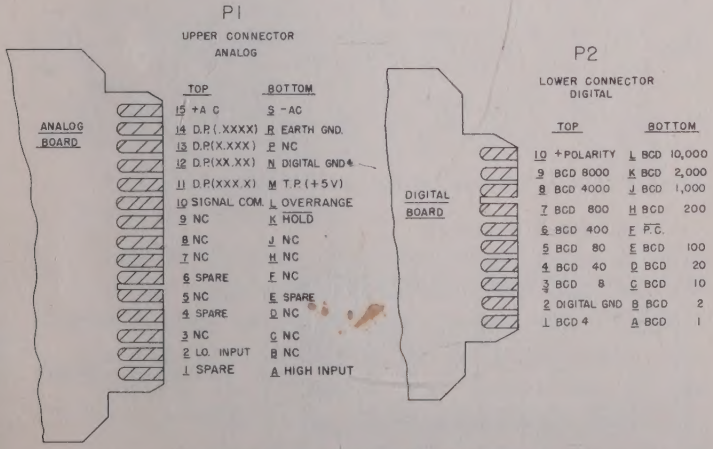



**Figure 5. Connector Pin Designations**

## OPERATION

1. After the meter has been panel mounted, connect power and input signal to upper connector P1 (Analog) as listed below. Refer to Figures 4 and 5 for connector pin designations and Figure 6 for location and functions of controls for trim adjustments.
   a. High side of AC line to Pin 15 (internally fused)
   b. Low side of AC line to Pin S
   c. Earth ground to Pin R
   d. Common of input signal to Pin 10
   e. Input signal Pin 2 for 200mV, 2V, or any current range (Pin A for 20V, 200V, or 1000V range.)
2. Allow meter to warm up for 30 minutes.
3. Remove front assembly.
4. Connect a standard signal source ± 0.01% to input terminals, common to Pin 10 and "+" or "-" signal to high input signal Pin 2 for 200mV, 2V, or any current range (Pin A for 20V, 200V, or 1000V range.)

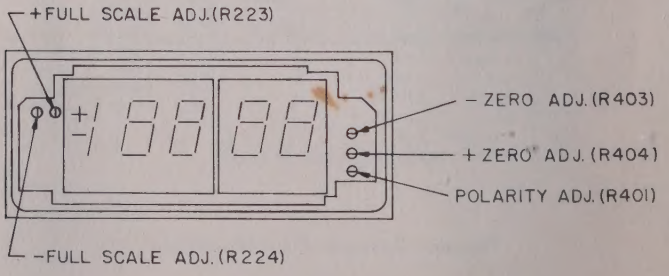



**Figure 6. Trim Adjustments**

5. Index standard signal source to 00.00. Rotate R401 until polarity symbol just extinguishes.
6. Index standard signal source to a signal equal to "+" 10 counts (e.g., 00.10 millivolts, 200 millivolt range) rotate R404 until display indicates 00.10.
7. Index standard signal source to a signal equal to "-" 10 counts (-00.10 millivolts, 200 millivolt range.) Rotate R403 until display indicates -0010.
8. Index standard signal source to a signal equal to "+" 16000 counts (160.00 millivolts, 200 millivolt range.) Rotate R223 until display indicates 16000.
9. Index standard signal source to a signal equal to "-" 16000 counts (-160.00 millivolts, 200 millivolt range.) Rotate R224 until display indicates -160.00.
10. Repeat steps 4 through 9 until all readings are correct. The instrument is now ready for operation.
11. If the applied input signal is greater than full scale range, the display will blank the four full digits to prevent erroneous readings. A binary signal in the BCD outputs simultaneously assumes the Logical "1" state to signal external equipment that the over-range condition exists.
12. External selection of decimal points are provided at the rear upper connector P1 (Analog). Shorting pins 11, 12, 13, or 14 to Logic ground (pin N) will illuminate the decimal at the left of the units, tens, hundreds, or thousands digit respectively. If the decimal selection is to be effected by switching, allowance should be made for up to 90 volts at the ungrounded positions.

13. Table 3 is an example of display indications for a 200 millivolt range meter.

**TABLE 3. DISPLAY FOR 200mV RANGE**

| APPLIED SIGNAL VOLTAGE | INDICATION ON DISPLAY |
|---|---|
| +200 to +300 millivolts | "1" (outrange with zeros blanked) |
| +00.00 to +199.99 millivolts | 00.00 to 199.99 |
| -00.00 to -199.99 millivolts | -00.00 to -199.99 |
| -200 to -300 millivolts | "-1" (outrange with zeros blanked) |

14. To maintain the last reading on the display and to maintain the last BCD output at the terminals, the meter is equipped with a remote $\overline{\text{HOLD}}$ input. The display (and BCD) can be held indefinitely by closing a switch between Pin K ($\overline{\text{HOLD}}$) and Pin N (digital ground) of the upper connector (Analog). Normal operation is resumed by opening the switch. The $\overline{\text{HOLD}}$ input terminal may be operated from mechanical switch contacts or a TTL/DTL micrologic output. The polarity indication is not held.

15. Lower Connector (Digital)
As an option, four decades of 1-2-4-8 BCD and the numeric 10000 can be provided at the rear Lower Connector (Digital) to drive external devices.

The rise and fall time of the BCD outputs are compatible with industrial TTL (Transistor-Transistor Logic) micrologic or its equal. Logic levels are: Logic 1 equal to or greater than 2.4 volts DC, and

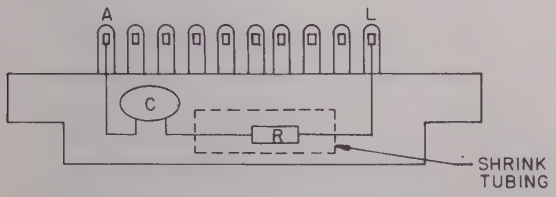
Logic 0 equal to or less than 0.8 volts DC. For applications where other Logic levels must be met, interface criteria should be coordinated with the factory.

16. $\overline{\text{Print Command}}$ Pin F of lower connector. The purpose of $\overline{\text{P.C.}}$ is to key the external printing devices for BCD information acceptance (Ref Para. 15). The output of Pin F is a logic "1" for holding the printing devices and a logic "0" for a command to print.

17. Due to the clock frequency and the propagation delay of the counters, the capacitance of the external wiring to the BCD information becomes critical. The use of long leads or shielded wire from the BCD connector to the external interface circuitry should be avoided.

    A digital connector with an attached RC network (Ref. Fig. 7) is available as an accessory under Part Number 277371-901. This network will allow the user to connect leads up to a maximum 18 inches in length to the unit.

    **NOTE:** The BCD outputs have available a load factor of two TTL.




C – Capacitor, 330 pF  R – Resistor, 91 ohms

**Figure 7. External Digital Connector**

## THEORY OF OPERATION

Fundamental to the operating cycle of the Model 1234 Digital Panel Meter, the Dual Slope Integration* method of analog to digital conversion provides useful insight into circuit operation. In dual slope integration, a conversion cycle comprises two integration intervals. During the first, a precision electronic integrator receives the input signal, or a derived signal directly proportional to it, for a fixed period of time. The integrator output, which has an initial voltage level of exactly zero volts, is thus caused to ramp away from zero at a rate proportional to input signal amplitude. At the end of this fixed initial interval, the integrator output is at a level uniquely determined by the input signal amplitude.

Upon completion of the initial phase, the input signal is replaced at the integrator input by a precision reference having the opposite polarity. The integrator output thus is caused to ramp back toward its zero output condition at a rate which is controlled by the fixed reference. Since the rate of this reverse ramp is determined by the reference amplitude, and the initial value is proportional to the input signal, the time required to reach zero integrator output is directly proportional to input signal amplitude.The duration of this second ramp is measured by the accumulation of "clock" pulses in a 20,000 bit BCD counter. The duration of the initial integration was set by counting a fixed number of pulses from this same clock, so that actual clock frequency is of no great importance to device accuracy. Moreover, the possible errors due to drift in component characteristics in the integrator are avoided in this scheme, since both signal and reference are subject to the effects of any such drift.

*U.S. Patents 3,051,939; 3,316,547 and other Patents Pending

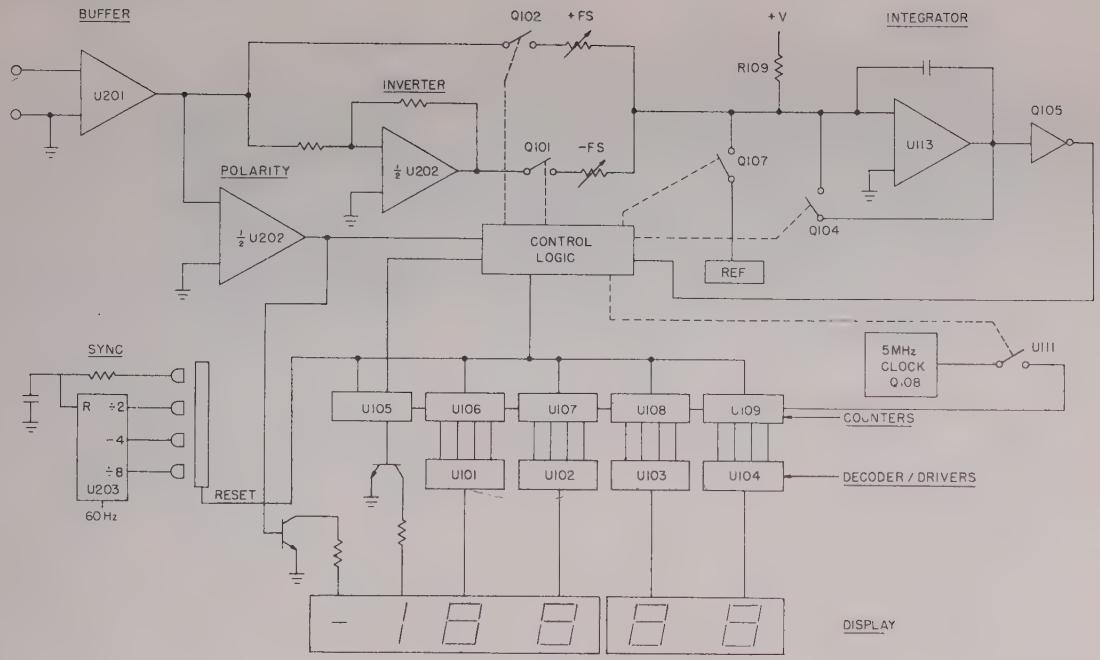



**Figure 8. Block Diagram**

In the Model 1234, a precision buffer stage (U201) provides high input impedance and low input bias current for minimum source – instrument interaction. The low impedance output from U201 (See Figure 8 Block Diagram) is monitored for polarity by a comparator (1/2 U202), which controls selection of the signal path from U201 to the integrator U113. Positive signals are passed directly to U113 through the switching matrix, whereas negative signals are first inverted by a -1.0000 amplifier (1/2 U202). Individual controls are inserted in each signal channel, allowing independent control of DPM calibration for positive and negative signals.

Prior to the commencement of a particular conversion, a 7490 counter U203 monitors line voltage zero crossings. When the selected U203 output goes high, it causes all counters and logic to be reset in preparation for the new conversion.

Note that U203 outputs corresponding to a 30, 15 and 7.5 per second (60Hz line) may be selected in determining Model 1234 sample rate. It is also worth noting that during the interval preceding the U203 output pulse, neither input signal nor reference were applied to the integrator; instead, its output had been connected to its inverting input by switch Q104. This assures that the subsequent integration of the input signal begins with zero integrator output.

Upon delivery of the U203 output pulse, the appropriate signal channel is connected to the U113 input, causing the first ramp phase to begin; simultaneously, the 5MHz clock signal from Q108 is gated into the counter chain, which has just been reset to zero. When 18,000 counts have been received, the selected signal channel is disabled and the precision reference is applied by Q107. The reverse ramp is thus initiated, and continues until the integrator output reaches zero, as sensed by detector Q105. The collector signal from Q105 is delivered via control logic to the clock gate, disabling the flow of counts into the counter chain, and ending the conversion.

The selection of the 18,000 count switching point for integrator control derives from the difficulty otherwise encountered in identifying the instant of zero crossing with the small ramps produced by small input signals. A fixed 2,000 count offset signal is injected at the integrator summing junction through R109, and continues throughout the conversion cycle. The effect of this analog offset is to add to the final integrator output voltage (following the initial ramp) an amount corresponding to 2,000 counts of reverse ramp. Thus even a small signal produces a crisp ramp whose zero crossing can readily be discriminated by Q105; the 2,000 count digital offset produces a final counter total which corresponds precisely to the input signal amplitude.

The Model 1234 display is operated from positive half cycles of high voltage excitation at the line frequency rate. Thus the display "on" time lasts roughly 6 milliseconds per cycle (60Hz line), and is followed by an "off" interval of some 10 milliseconds. The sync divider, U203, is so arranged that each new conversion begins immediately after a display "on" interval has been completed. As a result, the complete A/D conversion can be accomplished before the beginning of the next display "on" interval. Since the clock signal gate was disabled at the time of zero crossing of the integrator ramp voltage, and remains in that state until a new reset pulse initiates the next conversion, the data remains valid in the counter chain U105 — U109, driving decoder-drivers U101 — U104 for subsequent display illuminations. Where BCD outputs are provided, they are derived from these same counter outputs.

**TABLE 4. RANGING COMPONENTS**

| BOARD ASSY 117/100VAC | BOARD ASSY 220/240VAC | RANGE | R201 | R202 | R203 |
|---|---|---|---|---|---|
| 276028-901 | 276028-911 | 200mV | | – | |
| 276028-902 | 276028-912 | 2V* | – | – | – |
| 276028-903 | 276028-913 | 20V | 276946-001 | 276944-001 | 276944-001 |
| 276028-904 | 276028-914 | 200V* | 276946-001 | 276944-001 | 276944-001 |
| 276028-905 | 276028-915 | 1000V* | 276945-001 | 276944-001 | 276944-001 |
| 276028-906 | 276028-916 | 20μA | 272257-001 | – | |
| 276028-907 | 276028-917 | 200μA | ND29492-001 | – | – |
| 276028-908 | 276028-918 | 2mA | ND60534-001 | – | – |
| 276028-909 | 276028-919 | 20mA | ND60527-001 | – | – |
| 276028-910 | 276028-920 | 200mA | ND61263-001 | – | – |

*Split Pad "A" on analog board open for 2V, 200V and 1000V ranges, bridged for others.

**TABLE 5. COMPONENT DESCRIPTION**

| PART NUMBER | DESCRIPTION |
|---|---|
| ND29492-001 | RESISTOR, 1k ohm ±1%, 1/3 Watt |
| ND60527-001 | RESISTOR, 10 ohms ±0.1%, 1.3 Watts |
| ND60534-001 | RESISTOR, 100 ohms ±0.1%, 1.3 Watts |
| ND61263-001 | RESISTOR, 1 ohm ±0.1% 1/4 Watt |
| 272257-001 | RESISTOR, 10k ohms ±1/2%, 1/8 Watt |
| 276944-001 | RESISTOR, 2.49M ohms ±1/2%, 1/2 Watt |
| 276945-001 | RESISTOR, 4.99k ohms ±1/2%, 1/10 Watt |
| 276946-001 | RESISTOR, 49.9k ohms ±1/2%, 1/10 Watt |

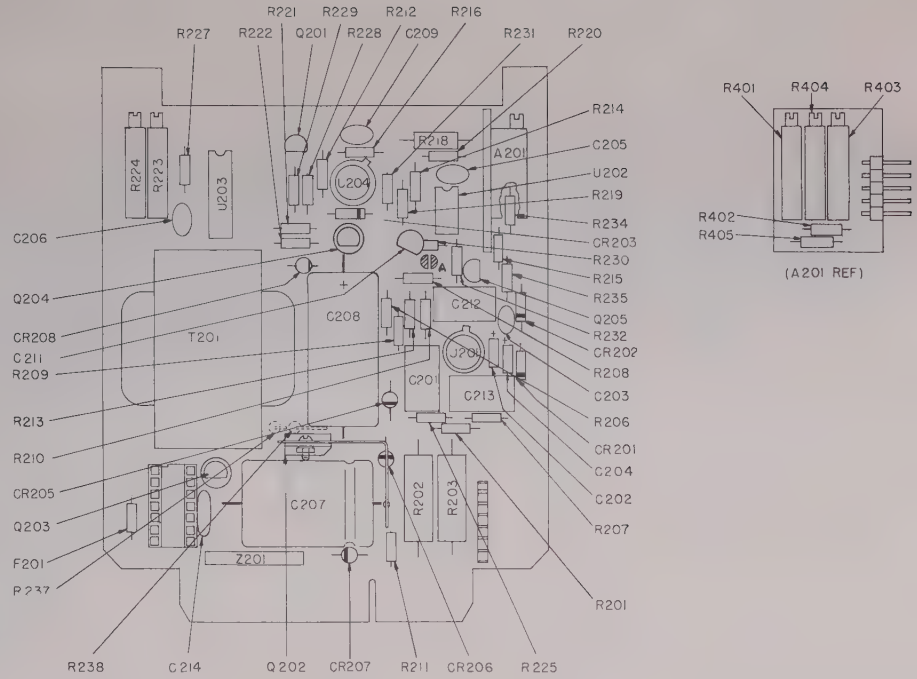



**Figure 9. Board Assembly, Analog**

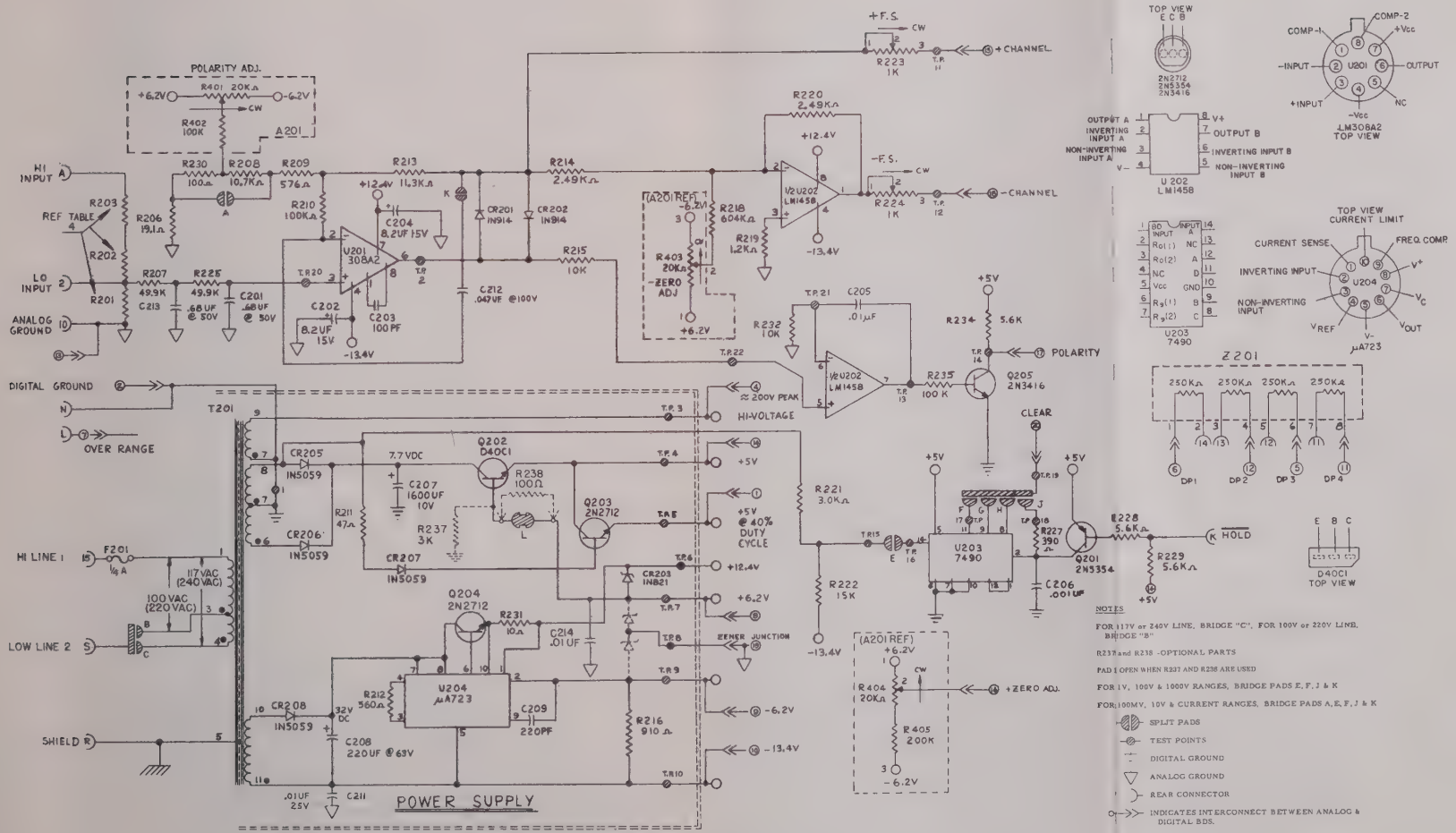



**Figure 10. Schematic Diagram, Analog**

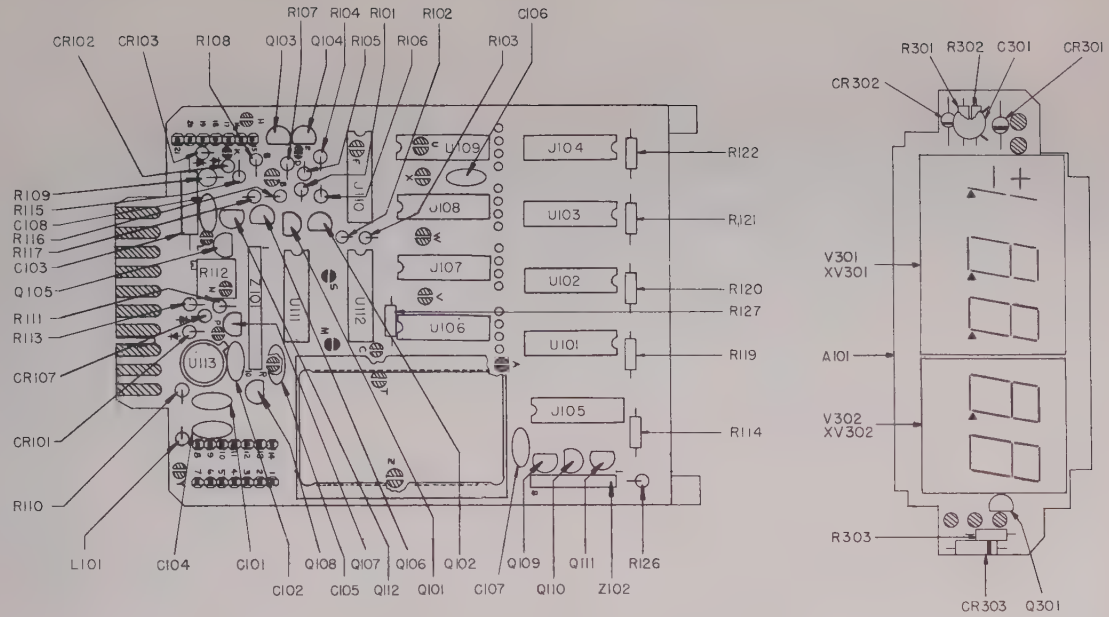



**Figure 11. Board Assembly, Digital**

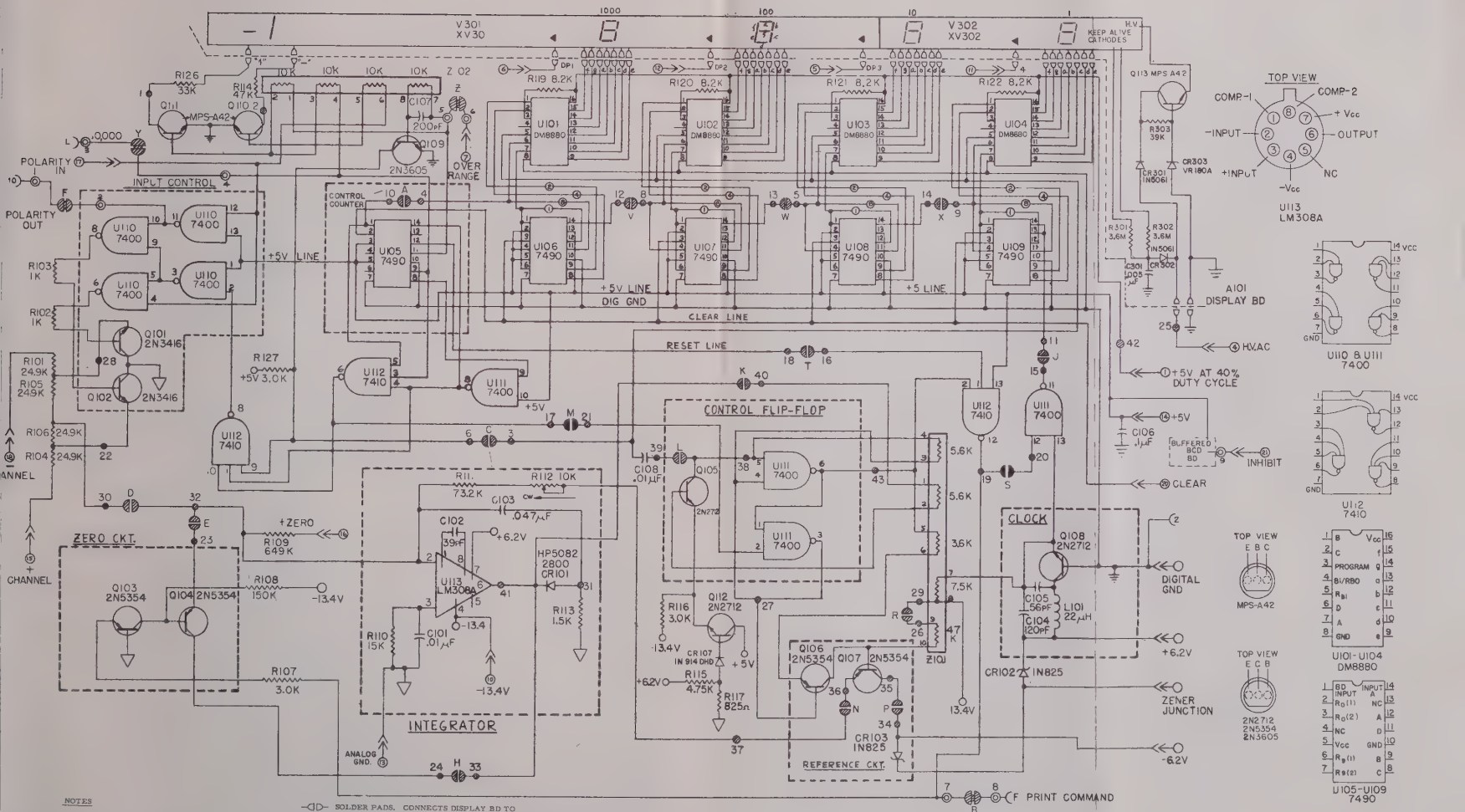



**Figure 12. Schematic Diagram, Digital**

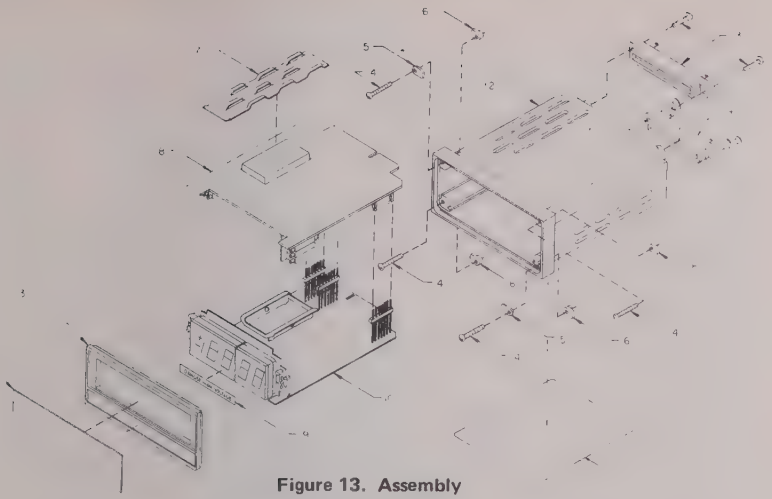


**Figure 13. Assembly**

**PARTS LIST**

| ITEM NUMBER | DESCRIPTION | PART NUMBER |
|---|---|---|
| | **ASSEMBLY (Ref Figure 13)** | |
| 1 | WINDOW | 265664-001 |
| 2 | DELETED | – |
| 3 | FRONT | 265657-001 |
| 4 | SCREW | 266623-045 |
| 5 | CLAMP, CIRCUIT BOARD | 265663-001 |
| 6 | CLAMP, PANEL MTG. | 265661-024 |
| 7 | SINK, HEAT | 265677-007 |
| 8 | BOARD ASSY, ANALOG (Ref Table 4) | – |
| 9 | LABEL, HIGH VOLTAGE | 277158-001 |
| 10 | BOARD ASSY, DIGITAL (Without BCD) | 276022-901 |
| 10 | BOARD ASSY, DIGITAL (With BCD) | 276640-901 |
| 11 | LABEL, CASE, 117V (Without BCD) | 276584-903 |
| 11 | LABEL, CASE, 100V (Without BCD) | 276584-901 |
| 11 | LABEL, CASE, 117V (With BCD) | 276584-904 |
| 11 | LABEL, CASE, 100V (With BCD) | 276584-902 |
| 11 | LABEL, CASE, 220V (Without BCD) | 277364-901 |
| 11 | LABEL, CASE, 240V (Without BCD) | 277364-902 |
| 11 | LABEL, CASE, 220V (With BCD) | 277364-903 |
| 11 | LABEL, CASE, 240V (With BCD) | 277364-904 |
| 12 | CASE | 265658-001 |
| 13 | CONNECTOR, PACKAGE, ANALOG (Per order) | 267253-901 |
| 14 | CONNECTOR, PACKAGE, DIGITAL (Per order) | 277371-901 |

| REFERENCE SYMBOL | DESCRIPTION | PART NUMBER |
|---|---|---|
| | **BOARD ASSY, ANALOG (Ref Figures 9 & 10)** | |
| A201 | BOARD ASSY, ZERO ADJUST (See sep. list for details) | 276592-901 |
| C201 | CAPACITOR, 0.68μF ±20%, 50WVDC | 270034-001 |
| C202 | CAPACITOR, 8.2μF ±20%, 15WVDC | 269952-001 |
| C203 | CAPACITOR, 100pF ±10%, 1000WVDC | 264089-001 |
| C204 | CAPACITOR, 8.2μF ±20%, 15WVDC | 269952-001 |
| C205 | CAPACITOR, 0.01μF +80% -20%, 50WVDC | 269899-001 |
| C206 | CAPACITOR, 0.001μF ±10%, 1000WVDC | 266417-001 |
| C207 | CAPACITOR, 1600μF +50% -10%, 10WVDC | 266607-001 |
| C208 | CAPACITOR, 220μF +50% -10%, 63WVDC | 272269-001 |
| C209 | CAPACITOR, 220pF ±10%, 1000WVDC | 264091-001 |
| C211 | CAPACITOR, 0.01μF +80% -20%, 50WVDC | 269899-001 |
| C212 | CAPACITOR, 047μF ±10%, 100WVDC | 277045-001 |
| C213 | CAPACITOR, 0.68μF ±20%, 50WVDC | 270034-001 |
| C214 | CAPACITOR, 0.01μF + 80% - 20%, 50WVDC | 269899-001 |
| CR201 | DIODE, 1N914 | ND61025-001 |
| CR202 | DIODE, 1N914 | ND61025-001 |
| CR203 | DIODE, 1N821 | 263207-001 |
| CR205 | DIODE, 1N5059 | 266611-001 |
| CR206 | DIODE, 1N5059 | 266611-001 |
| CR207 | DIODE, 1N5059 | 266611-001 |
| CR208 | DIODE, 1N5059 | 266611-001 |
| F201 | FUSE, PICO, 1/4 AMP, 125 Volts | 268798-001 |
| Q201 | TRANSISTOR, 2N5354 | 268795-001 |
| Q202 | TRANSISTOR, D40C1 | 268797-001 |
| Q203 | TRANSISTOR, 2N2712 | ND39917-001 |
| Q204 | TRANSISTOR, 2N2712 | ND39917-001 |
| Q205 | TRANSISTOR, 2N3416 | 263642-001 |
| R201 | RESISTOR (Ref Table 4) | — |
| R202 | RESISTOR (Ref Table 4) | — |
| R203 | RESISTOR (Ref Table 4) | — |
| R206 | RESISTOR, 19.1 ohms ±1%, 1/10 Watt | 276966-001 |
| R207 | RESISTOR, 49.9k ohms ±1%, 1/8 Watt | 269884-001 |
| R208 | RESISTOR, 10.7k ohms ±1/2%, 1/10 Watt | 276932-001 |
| R209 | RESISTOR, 576 ohms ±1/2%, 1/10 Watt | 276933-001 |
| R210 | RESISTOR, 100k ohms ±1%, 1/8 Watt | 269885-001 |

## PARTS LIST

| REFERENCE SYMBOL | DESCRIPTION | PART NUMBER |
|---|---|---|
| | **BOARD ASSY, ANALOG (Ref Figures 9 & 10 (Cont)** | |
| R211 | RESISTOR, 47 ohms ±10%, 1/4 Watt | ND61218-001 |
| R212 | RESISTOR, 560 ohms ±5%, 1/4 Watt | 269910-001 |
| R213 | RESISTOR, 11.3k ohms ±1/2%, 1/10 Watt | 276934-001 |
| R214 | RESISTOR, 2.49k ohms ±1/2%, 1/10 Watt | 272250-001 |
| R215 | RESISTOR, 10k ohms ±5%, 1/4 Watt | 264673-001 |
| R216 | RESISTOR, 910 ohms ±5%, 1/4 Watt | 266322-001 |
| R218 | RESISTOR, 604k ohms ±1%, 1/8 Watt | 272254-001 |
| R219 | RESISTOR, 1.2k ohms ±5%, 1/4 Watt | 266614-001 |
| R220 | RESISTOR, 2.49k ohms ±1/2%, 1/10 Watt | 272250-001 |
| R221 | RESISTOR, 3k ohms ±5%, 1/4 Watt | 269857-001 |
| R222 | RESISTOR, 15k ohms ±5%, 1/4 Watt | 263655-001 |
| R223 | RESISTOR, VARIABLE, 1k ohms ±10%, 1 Watt | 278126-001 |
| R224 | RESISTOR, VARIABLE, 1k ohms ±10%, 1 Watt | 278126-001 |
| R225 | RESISTOR, 49.9k ohms ±1%, 1/8 Watt | 269884-001 |
| R227 | RESISTOR, 390 ohms ±5%, 1/4 Watt | 272246-001 |
| R228 | RESISTOR, 5.6k ohms ±5%, 1/4 Watt | 265819-001 |
| R229 | RESISTOR, 5.6k ohms ±5%, 1/4 Watt | 265819-001 |
| R230 | RESISTOR, 100 ohms ±1%, 1/8 Watt | 269925-001 |
| R231 | RESISTOR, 10 ohms ±1%, 1/10 Watt | 269915-001 |
| R232 | RESISTOR, 10k ohms ±5%, 1/4 Watt | 264673-001 |
| R234 | RESISTOR, 5.6k ohms ±5%, 1/4 Watt | 265819-001 |
| R235 | RESISTOR, 100k ohms ±5%, 1/4 Watt | 266592-001 |
| *R237 | RESISTOR, 3k ohms ±1%, 1/10 Watt | 272217-001 |
| *R238 | RESISTOR, 100 ohms ±0.5%, 1/8 Watt | 276200-001 |
| T201 | TRANSFORMER, 117/100 VAC | 277319-001 |
| T201 | TRANSFORMER, 220/240 VAC | 277320-001 |
| U201 | INTEGRATED CIRCUIT, LM308A2 | 271818-001 |
| U202 | INTEGRATED CIRCUIT, LM1458 | 276439-001 |
| U203 | INTEGRATED CIRCUIT, LM7490 | 272267-001 |
| U204 | INTEGRATED CIRCUIT, μA723 | 276437-001 |
| – | SOCKET, 1C | 276988-001 |
| - | BOARD, DRILLED | 276027-901 |
| - | HEAT SINK | 277927-032 |

*Optional part

## PARTS LIST

| REFERENCE SYMBOL | DESCRIPTION | PART NUMBER |
|---|---|---|
| | **DISPLAY BOARD ASSY (Ref Figures 11 & 12)** | |
| C301 | CAPACITOR, 0.005μF +60% -40%, 150WVDC | 266609-001 |
| CR301 | DIODE, 1N5061 | 276986-001 |
| CR302 | DIODE, 1N5061 | 276986-001 |
| CR303 | DIODE, VR180A | 277035-001 |
| Q301 | TRANSISTOR, MPS-A42 | 276920-001 |
| R301 | RESISTOR, 3.6M ohms ±5%, 1/4 Watt | 272240-001 |
| R302 | RESISTOR, 3.6M ohms ±5%, 1/4 Watt | 272240-001 |
| R303 | RESISTOR, 39k ohms ±5%, 1/4 Watt | 263656-001 |
| V301 | DISPLAY, NUMERIC, 2-1/2 Digit, SP354 | 276394-001 |
| V302 | DISPLAY, NUMERIC, 2 Digit, SP352 | 276395-001 |
| XV301 | SOCKET, DISPLAY, CS353 | 276928-001 |
| XV302 | SOCKET, DISPLAY, CS352 | 276927-001 |
| – | BOARD, DRILLED | 276024-901 |
| | **ZERO ADJUST BOARD ASSY (Ref Figures 9 & 10)** | |
| R401 | RESISTOR, VARIABLE, 20k ohms ±10%, 1 Watt | 278125-001 |
| R402 | RESISTOR, 100k ohms ±1%, 1/8 Watt | 269885-001 |
| R403 | RESISTOR, VARIABLE, 20k ohms ±10%, 1 Watt | 278125-001 |
| R404 | RESISTOR, VARIABLE, 20k ohms ±10%, 1 Watt | 278125-001 |
| R405 | RESISTOR, 200k ohms ±1%, 1/10 Watt | 276965-001 |
| - | HEADER | 276589-001 |
| – | BOARD, DRILLED | 276591-901 |
| | **BOARD ASSY, DIGITAL (Ref Figures 11 & 12)** | |
| A101 | BOARD ASSY, DISPLAY (See sep. list for details) | 276025-901 |
| C101 | CAPACITOR, 0.01μF +80% -20%, 50WVDC | 269899-001 |
| C102 | CAPACITOR, 39pF ±10%, 1000WVDC | 276275-001 |
| C103 | CAPACITOR, 0.047μF ±10%, 50WVDC | 276961-001 |
| C104 | CAPACITOR, 120pF ±10%, 1000WVDC | 264090-001 |
| C105 | CAPACITOR, 56pF ±10%, 1000WVDC | 266697-001 |
| C106 | CAPACITOR, 0.1μF +80% -20%, 10WVDC | 272376-001 |
| C107 | CAPACITOR, 200pF ±10%, 1000WVDC | 266542-001 |
| C108 | CAPACITOR, 0.1μF +80% -20%, 50WVDC | 269899-001 |
| CR101 | DIODE, HP5082-2800 | 269959-001 |
| CR102 | DIODE, 1N825 | 266309-001 |
| CR103 | DIODE, 1N825 | 266309-001 |
| CR107 | DIODE, 1N914DHD | ND61025-001 |
| L101 | INDUCTOR, 22μH ±10% | 272270-001 |

## PARTS LIST

| REFERENCE SYMBOL | DESCRIPTION | PART NUMBER |
|---|---|---|
| | **BOARD ASSY, DIGITAL (Ref Figures 11& 12) (Cont)** | |
| Q101 | TRANSISTOR, 2N3416 | 263642-001 |
| Q102 | TRANSISTOR, 2N3416 | 263642-001 |
| Q103 | TRANSISTOR, 2N5354 | 268795-001 |
| Q104 | TRANSISTOR, 2N5354 | 268795-001 |
| Q105 | TRANSISTOR, 2N2712 | ND39917-001 |
| Q106 | TRANSISTOR, 2N5354 | 268795-001 |
| Q107 | TRANSISTOR, 2N5354 | 268795-001 |
| Q108 | TRANSISTOR, 2N2712 | ND39917-001 |
| Q109 | TRANSISTOR, 2N3605 | 268796-001 |
| Q110 | TRANSISTOR, MPS-A42 | 276920-001 |
| Q111 | TRANSISTOR, MPS-A42 | 276920-001 |
| Q112 | TRANSISTOR, 2N2712 | ND39917-001 |
| R101 | RESISTOR, 24.9k ohms ±1%, 1/10 Watt | 272251-001 |
| R102 | RESISTOR, 1k ohms ±5%, 1/4 Watt | 266612-001 |
| R103 | RESISTOR, 1k ohms ±5%, 1/4 Watt | 266612-001 |
| R104 | RESISTOR, 24.9k ohms ±1%, 1/10 Watt | 272251-001 |
| R105 | RESISTOR, 24.9k ohms ±1%, 1/10 Watt | 272251-001 |
| R106 | RESISTOR, 24.9k ohms ±1%, 1/10 Watt | 272251-001 |
| R107 | RESISTOR, 3k ohms ±5%, 1/4 Watt | 269857-001 |
| R108 | RESISTOR, 150k ohms ±5%, 1/4 Watt | 263653-001 |
| R109 | RESISTOR, 649k ohms ±1%, 1/8 Watt | 272279-001 |
| R110 | RESISTOR, 15k ohms ±5%, 1/4 Watt | 263655-001 |
| R111 | RESISTOR, 73.2k ohms ±1%, 1/10 Watt | 272252-001 |
| R112 | RESISTOR, VARIABLE, 10k ohms ±5% | 276960-001 |
| R113 | RESISTOR, 1.5k ohms ±1%, 1/8 Watt | 270156-001 |
| R114 | RESISTOR, 47k ohms ±5%, 1/4 Watt | 264676-001 |
| R115 | RESISTOR, 4.75k ohms ±1%, 1/8 Watt | 272238-001 |
| R116 | RESISTOR, 3k ohms ±5%, 1/4 Watt | 269857-001 |
| R117 | RESISTOR, 825 ohms ±1%, 1/8 Watt | 269888-001 |
| R119 | RESISTOR, 8.2k ohms ±5%, 1/4 Watt | 268788-001 |
| R120 | RESISTOR, 8.2k ohms ±5%, 1/4 Watt | 268788-001 |
| R121 | RESISTOR, 8.2k ohms ±5%, 1/4 Watt | 268788-001 |
| R122 | RESISTOR, 8.2k ohms ±5%, 1/4 Watt | 268788-001 |
| R126 | RESISTOR, 33k ohms ±5%, 1/4 Watt | 269869-001 |
| R127 | RESISTOR, 3k ohms ±5%, 1/4 Watt | 269857-001 |
| U101 | INTEGRATED CIRCUIT, DM8880 | 274715-001 |
| U102 | INTEGRATED CIRCUIT, DM8880 | 274715-001 |
| U103 | INTEGRATED CIRCUIT, DM8880 | 274715-001 |
| U104 | INTEGRATED CIRCUIT, DM8880 | 274715-001 |

**PARTS LIST**

| REFERENCE SYMBOL | DESCRIPTION | PART NUMBER |
|---|---|---|
| | **BOARD ASSY, DIGITAL (Ref Figures 11 & 12) (Cont)** | |
| U105 | INTEGRATED CIRCUIT, DM7490 | 272267-001 |
| U106 | INTEGRATED CIRCUIT, DM7490 | 272267-001 |
| U107 | INTEGRATED CIRCUIT, DM7490 | 272267-001 |
| U108 | INTEGRATED CIRCUIT, DM7490 | 272267-001 |
| U109 | INTEGRATED CIRCUIT, DM7490 | 272267-001 |
| U110 | INTEGRATED CIRCUIT, DM7400 | 272264-001 |
| U111 | INTEGRATED CIRCUIT, DM7400 | 272264-001 |
| U112 | INTEGRATED CIRCUIT, DM7410 | 272268-001 |
| U113 | INTEGRATED CIRCUIT, LM308A | 272408-001 |
| Z101 | RESISTOR, MODULE | 276033-001 |
| Z102 | RESISTOR, MODULE | 276034-001 |
| – | HEADER (3 reqd.) | 276030-901 |
| – | BOARD, DRILLED | 276021-901 |

## WESTON EQUIPMENT WARRANTY

Weston warrants equipment of its manufacture against defective materials or workmanship for a period of one year from date of shipment.

The liability of Seller under this warranty is limited, at Seller's option, solely to repair, replacement with equivalent Weston equipment, at an appropriate credit adjustment not to exceed the original equipment sales price, of equipment returned to the Seller provided that (a) Seller is promptly notified in writing by Buyer upon discovery of defects, (b) Upon receipt of written authorization from Seller the defective equipment is returned as directed, transportation charges prepaid by Buyer, and (c) Seller's examination of such equipment discloses to his satisfaction that defects were not caused by negligence, misuse, improper installation, accident, or unauthorized repair or alteration by the Buyer.

This warranty does not include mechanical parts failing from normal usage nor does it cover limited life electrical components which deteriorate with age such as tubes, lamps, etc.

This warranty is in lieu of all other warranties, expressed or implied, including the implied warranty of fitness for a particular purpose to the original purchaser or to any other person. Seller shall not be liable for consequential damages of any kind.

The aforementioned provisions do not extend the original warranty period of any article which has been either repaired or replaced by Seller.

www.manualsplus.com
1028233